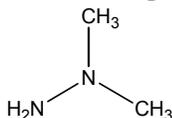


1,1-DIMETHYLHYDRAZINE

CAS No. 57-14-7

First Listed in the *Fourth Annual Report on Carcinogens*



CARCINOGENICITY

1,1-Dimethylhydrazine (unsymmetrical dimethylhydrazine; UDMH) is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1974, 1982, 1999). When administered by gavage, 1,1-dimethylhydrazine increased the incidence of lung tumors in female mice. When administered in drinking water, 1,1-dimethylhydrazine induced high incidences of angiosarcomas in various organs and tumors of the kidneys, lungs, and liver in mice of both sexes. The same route of administration induced liver carcinomas in rats.

No adequate data were available to evaluate the carcinogenicity of 1,1-dimethylhydrazine in humans (IARC 1974, 1999).

PROPERTIES

1,1-Dimethylhydrazine is a clear, colorless, flammable, hygroscopic liquid with an ammonia-like, fishy odor. 1,1-Dimethylhydrazine is miscible with water, ethanol, ether, dimethylformamide, and hydrocarbons. The liquid fumes in air and gradually turns yellow. It is easily ignited by heat, flame, or oxidizers, and its vapor may form explosive mixtures with air. During combustion, it emits toxic fumes of nitrogen oxide. 1,1-Dimethylhydrazine is available in the United States as a single grade containing 98% (minimum) active ingredient with 1.9% (maximum) dimethylamine and 0.3% (maximum) water content (IARC 1999, HSDB 2000).

USE

1,1-Dimethylhydrazine is primarily used as a component of jet and rocket fuels. Other uses include an intermediate for chemical synthesis, a stabilizer for organic peroxide fuel additives, an absorbent for acid gases, a plant growth control agent, and in photography (ATSDR 1997, IARC 1999, HSDB 2000).

PRODUCTION

Production of 1,1-dimethylhydrazine was first reported to the U.S. Tariff Commission in 1956 (IARC 1974). Two current U.S. manufacturers and nine suppliers were identified (ATSDR 1997, HSDB 2000, Chem Sources 2001). Current information on production volumes for 1,1-dimethylhydrazine and data on past or current import or export quantities were not publicly available (ATSDR 1997). However, U.S. imports and exports of non-aromatic organic derivatives of hydrazine or of hydroxylamine were approximately 4.3 million lb and 6.1 million lb, respectively, in 2000 (ITA 2001). Past production quantities reported for the chemical were 45 metric tons (99,000 lb) in 1977 and 4.5 metric tons (9,900 lb) in 1982 (ATSDR 1997, HSDB

2000). The 1979 TSCA Inventory identified four companies that produced 55,000 lb of 1,1-dimethylhydrazine in 1977 (TSCA 1979).

EXPOSURE

The primary routes of potential human exposure to 1,1-dimethylhydrazine are inhalation, ingestion, and dermal contact. Possible human exposure may occur during its production and use as a chemical intermediate or when applied to control the growth of crops and vegetation. Potential exposure by ingestion may occur if residues are present on foods treated with 1,1-dimethylhydrazine. For the general population, exposure to 1,1-dimethylhydrazine is expected to be very low due to its rapid environmental degradation; it has not been detected in air, water, or soil (ATSDR 1997).

Small amounts of 1,1-dimethylhydrazine (up to 147 ng/g) have been found in tobacco products; therefore, people who chew tobacco, smoke cigarettes, or are exposed to cigarette smoke indirectly may be exposed to small amounts of 1,1-dimethylhydrazine. In the past, humans have been exposed to 1,1-dimethylhydrazine following ingestion of fruits sprayed with the plant growth regulator Alar[®] (daminozide). Alar[®] is no longer used on food plants in the United States. It continues to be used on some non-food plants, and therefore, greenhouse workers who use Alar[®] may be exposed to small amounts of 1,1-dimethylhydrazine (ATSDR 1997).

The potential for exposure to 1,1-dimethylhydrazine is higher for workers that manufacture or use the chemical, people that live near a military installation where the chemical is used, or people that live near hazardous waste sites contaminated with hydrazines. In the workplace, exposure to 1,1-dimethylhydrazine may occur during its production, transportation, or use, especially if proper protective equipment is not used (ATSDR 1997). The National Occupational Exposure Survey (1981-1983) indicated that 2,917 workers were potentially exposed to 1,1-dimethylhydrazine (NIOSH 1984). This estimate was based only on observations of the actual use of the compound. The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that only 16 people were potentially exposed to 1,1-dimethylhydrazine as a decomposition product in the workplace (NIOSH 1976). EPA's Toxic Chemical Release Inventory (TRI) listed five industrial facilities that produced, processed, or otherwise used 1,1-dimethylhydrazine in 1999 (TRI99 2001). In 1999, five industrial facilities in the U.S. reported releasing 998 lb of 1,1-dimethylhydrazine to the air and approximately 8,000 lb were transferred off-site for treatment.

REGULATIONS

EPA regulates 1,1-dimethylhydrazine under the Clean Air Act (CAA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and Superfund Amendments and Reauthorization Act (SARA). The National Emission Standards for Hazardous Air Pollutants (NESHAP) addresses 1,1-dimethylhydrazine emissions from processing facilities under CAA. A reportable quantity (RQ) of 10 lb has been established for this chemical under CERCLA. 1,1-Dimethylhydrazine is subject to reporting requirements under RCRA and SARA.

ACGIH recommends a threshold limit value (TLV) at 0.01 ppm (0.025 mg/m³) for 1,1-dimethylhydrazine. NIOSH recommends an exposure limit of 0.06 ppm (0.15 mg/m³) as a ceiling concentration (120-minute). OSHA established a permissible exposure limit (PEL) for

this compound of 0.5 ppm (1 mg/m³) as an 8-hr time-weighted average (TWA). OSHA also regulates 1,1-dimethylhydrazine under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 77.

REFERENCES

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